ENERGY EFFICIENT ROUTING ALGORITHM

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Abstract: The main aim of energy efficient routing is to minimize the energy required to transmit or receive packets also called as active communication energy. Inactive energy is the energy which not only tries to reduce the energy consumed when a mobile node stays idle but also listens to the wireless medium for any possible communication requests from other nodes. To conserve energy, many energy efficient routing protocols have been proposed. Networks of small, inexpensive, disposable, smart sensors are emerging as a new technology with tremendous potential. Wireless sensor networks can be randomly deployed inside or close to phenomenon to be monitored. The advantage of these networks is the fact that they are self-configuring, which means that a sensor network can be deployed randomly on a battlefield, in a disaster area or in an inaccessible area without the need for human intervention. The energy supplies of nodes are not replenished or replaced and therefore nodes only participate in the network for as long as they have energy. This fact necessitates energy efficiency in the design of every aspect of such nodes. Energy consumption in sensor nodes occurs mainly due to computational processing and, to a greater extent, communication. The routing protocol employed by these sensor nodes can minimize the number of transmissions that nodes make as well as the computational complexity of routing path selection. It is therefore of critical importance that the routing protocol be designed with energy efficiency in mind.

I. INTRODUCTION

Lifetime of wireless *s*ensor node is correlated with the battery current usage profile. By being able to estimate the energy utilization of the sensor nodes, routing protocols and applications are able to construct informed decisions that enhance the lifetime of the sensor network. However, it is in general not feasible to measure the energy consumption on sensor node platforms. Reducing energy consumption and size are significant research topics in order to make wireless sensor networks (WSN) deployable. As most WSN nodes are battery powered, their lifetime is extremely reliant on their energy consumption. Due to the low cost of an individual node, it is more cost effectual to substitute the entire node than to locate the node and replace or recharge its battery supply. Node lifetime is a frequently discussed topic in platform design and analysis. In the last couple of years new platforms have demonstrated several new techniques for reducing power leakage during sleep time. Hardware components are characterized at a very detailed level to simulate power consumption of a node as close as possible. Another method uses hybrid automata models for analyzing power utilization of a node at the operating system level. In this paper describes an energy measurement system based on a node current consumption usage. To guesstimate the life span of activity monitoring system, the energy characteristics of sensor node is measured obliquely. One node is connected in series to a resistor. Using oscilloscope, voltage drop over the resistor is calculated. Current is calculated using values given by the oscilloscope.

II. ENERGY EFFICIENT ROUTING

A network that can function as long as possible is an ideal network. In an ad- hoc system the main limitation is the availability of power. Power is consumed on resources such as running the onboard electronics, the number of processes running and overheads required to maintain connectivity. The computing devices consist of mobile batteries in an adhoc network that communicates over the wireless medium. The memory space and the processing capacity of the nodes increase at a very quick speed, the battery method lags far behind. Hence, energy efficient protocols are derived to conserve energy and to increase the network life time as well as increase the device and network operation time. In particular, energy efficient routing may be the most important design criterion for MANETs, as mobile nodes will be powered by batteries with limited capacity. Overall network lifetime decreases because of the power failure of a mobile node. Also the ability to forward packets on behalf of others decreases. For this reason, many research efforts have been applied to develop energy-aware routing protocols. Instead of average case the worst case i.e when a first node dies out is maximized.Some energy proficient routing protocol includes Local Energy- Aware Routing based on AODV (LEARAODV), Power-Aware Routing based on AODV (PAR-AODV), and Lifetime Prediction Routing based on AODV (LPR- AODV).

III. PROPOSED ALGORITHM

The main aspire of the algorithm is to provide an energy saving conception for the mobile adhoc networks. Energy saving conception depends on numerous other factors like delay in the network, no of hops between source and target. These techniques are implemented in the network layer of the protocol which takes care of the routing theory. As there are no routers here the intermediate hoping acts like routing and thus this algorithm tends to diminish all the parameters applied in the network layer. Dynamic Source Routing only stores an arbitrary path between a source and destination pair during its route discovery phase. When a RREQ packet is sent by a source then it is flooded till it reaches the target and on reaching the packets are destroyed and the path traversed is simply cached there. But in this algorithm all the multipaths are first analyzed and their energy loss and transmission delay along with energy loss and the path is collected statistically. From there the minimum and the best path on the basis of hop count and energy loss is calculated. Hence the destination stores only this path in its cache for the chosen source.

Hence based on this two important factors and the formula mentioned above for computation a better energy efficient algorithm was developed. Sometimes in a MANET, the number of hops proves negative in determining the least energy path as the nodes are mobile and infrastructure less, so distance parameter obviously overcomes the difficulty with the hop counts here. But still comparison between algorithms of dynamic source routing and proposed algorithm can be done on the basis of hop counts.

Numerous general assumptions taken during establishment of an ad hoc network are as follows:
1) All the nodes partake in the transmission

2) The diameter of MANETs should be very diminutive (mostly within 30 hops)
3) The speed of the nodes should be modest
4) Link must be unidirectional with two proper in gates and the out gates for each node.
5) Just one node can be sending and one receiving node during a transmission in the network.

In this research implemented proposed algorithm taking 5, 10, 60 nodes in the network respectively. In each network a fixed node was chosen as the source node and then a set of destination was chosen. Then for each source and destination pair the minimum energy loss path was calculated.

Working of Proposed Algorithm
The working of proposed algorithm is as follows:
Initialization parameters:
1) Setup a network with N nodes and E edges
2) Select a node S as the source node
3) Select a set of nodes from N apart from S to act as target nodes.
4) Setup the delay parameter in the channel.
5) Initialize the type of the packet with parameters like hop count, energy and path.
6) The edges E of network (connections) are unidirectional as per the assumptions.
7) Therefore two distinct types of gates are taken for input and output
8) Initial packets hop count set as 0 and also energy =0.0mW

```
For (each target node in the set)
{
Initiate from the source node
While(packet−> path[ ] isnotnull)
If(node==target node)
Accumulate packet parameters for further calculation
else
{
        Int gaterange= count for the no of out gates for the
        node
        Copy the Route Request (RREQ) message packets
        Packet(hop_count) = packet(hop_count) + 1
        Determine energy En with the following formula
        En = (packet(hop_count) ∗ delay) + (x ∗ packet_size)
        + const
        (here x required for calculation will be that of the
        sending as well as of the intermediate nodes.)
        Packet− > energy = En
        For(eachgate <= gaterange)
        {
            Get node connected to gate
            If(packet−> path does not contain node)
            {
            Add node to packet− >path
            Send copy packets to node through gate
            }
        }
    }
}
 Get next node from packet−>path }
Hop[i]= least hop count from the collected data
Energy[i]= least energy loss from the accumulated data
 i=i+1
Pick another node from the set as destination node }
```

IV. SIMULATION AND RESULT

We have taken the simulation environment as omnet++. This simulation IDE is freely available for academic purposes. The network of particular dimension was constructed in the Omnet++ IDE and the diverse component of the project is as follows:
(1) Ned file
(2) Network file
(3) Header file <Packet_h.h>
(4) C++ file

This structure was repeated for networks of dimension 5, 10 and 60. Every time the simulation returns the average minimum hop count and energy loss. All the values were recorded in a table after every simulation for each size of network for proposed algorithm. More over the network life is also improved as the packets are not back flooded and all the multiple paths from source to destination is traversed in order to collect the best among them.

V. CONCLUSION

In this paper we proposed a routing approach with the aim to minimize the energy required to transmit or receive packets also called as active communication energy. Inactive energy is the energy which not only tries to reduce the energy consumed when a mobile node stays idle but also listens to the wireless medium for any possible communication requests from other nodes. Transmission power control approach method and load distribution method are the two methods which diminishes active communication energy. The sleep or power-down mode method reduces inactive energy. Both the protocol has specific benefits and drawbacks and therefore is applicable for certain situations. We also implemented our approach using Omnet++ for the network with nodes 5, 10 and 60. Using this simulation we showed the discovered routes for packet forwarding and we also calculated the energy consumed for different path. Out simulator always select the path that involves least energy loss.

Another major advantage of this algorithm is that it prevents back flooding of the packets. If a node is already added to the packet path then no more flooding of packets occur to that particular node. This not only saves the network obstruction but also enhances the life span of the packets and the network. The major disadvantage of this algorithm is that it follows breadth first search approach for the path discovery or intermediate node discovery. Hence all the child nodes of a particular node added to the path is also traversed even if they lead to a dead end after some iterations.

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